ACCUMULATION OF MICRONUTRIENTS BY DIFFERENT COMMON BEAN CULTIVARS GROWN IN DIFFERENT PLANT DENSITIES IN NO-TILLAGE CROP SYSTEM

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INTRODUCTION

The aim of the current study was to follow the accumulation of micronutrients throughout the crop cycle in different cultivars of common bean with carioca seed type, grown under different plant densities in field experiments using a no-tillage cropping system.

MATERIALS AND METHODS

The experimental design was randomized blocks with three replications and a 4x5 factorial scheme, involving four bean cultivars (Table 1) and five plant densities (75, 145, 215, 285 and 355 thousand plants.ha^{-1}). The sowing was carried out under *Brachiaria* grass dried with Roundup® (2,5 L.ha^{-1}, 30 days before the sowing) and Gramoxone® (2,0 L ha^{-1}, 8 days before the sowing). The experiment had not been irrigated. Each plot had four rows with 5.0 m length and spacing of 0.5 m between rows. At sowing (November, 2006), all the plots had received identical fertilization, determined by the soil analysis interpretation. The N fertilization at covering (at 30 days after emergency-DAE) was 30 kg.ha^{-1} of N, urea source. Every 10 days, samples of 10 plants were collected and dried under air circulation to 65-70°C, until constant mass, soon after they had been triturated and sent to the Laboratory of Leaf Analysis of the Soil Science Department (UFLA) for determination of the micronutrients content. The Cu, Fe, Mn e Zn content was evaluated by digestion by nitric and percloric acid and quantified in the extract (espectrophotometry of atomic absorption) and B by incineration and colorimetric determination by the curcumin method.

Table 1. Principal characteristics of the studied cultivars.

Characteristics	BRS Radiante*	Bolinha**	Ouro Vermelho*	Jalo EEP 558*
Commercial group	Others	Others	Others	Jalo
Seed color	cream / beige	yellow	red	yellow
Growth habit	I	II	II/III	III
100 grain's weight	44-45 g	32-33g	25 g	30-40 g
Stem	erect	erect	semi-erect	semiclimber
Cultural cycle	early	middle	normal	middle

* Ramalho & Abreu (2006), ** Alves (2008)

RESULTS AND DISCUSSION

At flowering, large proportion of the each micronutrient is reached by the bean cultivars. B is gradually accumulated along the whole cycle and Fe is accumulated in the quicker form in relation to the others micronutrients; in the case cv. Bolinha-B there was significant interation between DAE and plant population (Table 2). The bean cultivars do not differ in relation to the B, Mn and Zn accumulations, but the cv. Jalo accumulates more Cu, while the cvs. Bolinha and Radiant accumulates more Fe (Table 3). The general decreasing order of accumulation is Fe>B>Mn>Zn>Cu.

Table 2. Accumulation of micronutrients (g ha^{-1}) by four bean cultivars in function of DAE.

Cultivar	Nutrient	Regression	R^2 (%)
Bolinha	B at 75	$Y= -4,155611 + 0,441273 x + 0,003228 x^2$	94,88
	B at 145	$Y= -21,718631 + 1,662916 x - 0,002350 x^2$	92,35
	B at 215	$Y= -19,741923 + 1,867050 x - 0,008535 x^2$	97,48
	B at 285	$Y= -4,975721 + 0,834361 x + 0,007499 x^2$	98,28
	B at 355	$Y= -28,216113 + 2,712476 x - 0,008321 x^2$	90,61
	Cu	$Y= -9,436216 + 0,930805 x - 0,006817 x^2$	88,11
	Fe	$Y= -1003,677262 + 113,937586 x - 1,172568 x^2$	92,43
	Mn	$Y= -25,977993 + 3,741935 x - 0,029216 x^2$	95,29
	Zn	$Y= -27,074703 + 2,264467 x - 0,013827 x^2$	93,21
Jalo EEP 558	B	$Y= -18,756220 + 2,039851 x - 0,008537 x^2$	95,02
	Cu	$Y= -5,506187 + 0,590396 x - 0,001624 x^2$	88,87
	Fe	$Y= -769,060555 + 93,986887 x - 1,822413 x^2$	83,17
	Mn	$Y= -24,884055 + 4,219734 x - 0,040569 x^2$	91,51
	Zn	$Y= -29,846043 + 2,793384 x - 0,021157 x^2$	89,45
BRS Radiante	B	$Y= -17,625115 + 1,733246 x - 0,000899 x^2$	99,09
	Cu	$Y= -19,423468 + 1,666065 x - 0,014755 x^2$	87,29
	Fe	$Y= 1472,733119 + 178,060250 x - 2,143283 x^2$	85,63
	Mn	$Y= -32,832960 + 4,650177 x - 0,047058 x^2$	97,78
	Zn	$Y= -28,793130 + 2,784689 x - 0,021323 x^2$	82,14
Ouro Vermelho	B	$Y= -39,746584 + 3,172639 x - 0,018709 x^2$	86,27
	Cu	$Y= -18,000999 + 1,429942 x - 0,010922 x^2$	88,16
	Fe	$Y= -1166,673254 + 117,814557 x - 1,140581 x^2$	83,52
	Mn	$Y= -82,790714 + 7,388865 x - 0,062482 x^2$	87,85
	Zn	$Y= -62,642615 + 4,492009 x - 0,031991 x^2$	88,07

*At considered significant plant populations.

Table 3. Micronutrients accumulation (g ha^{-1}) in the aerial part of plant of four bean cultivars.

	B	Cu	Fe	Mn	Zn
Bolinha	80a	21b	959a	89a	60a
Jalo EEP 558	91a	32a	756b	72a	55a
BRS Radiante	85a	22b	1139a	70a	53a
OuroVermelho	77a	21b	553b	80a	53a

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